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EXAMINER	
WILSON, ALLAN R	

ART UNIT	PAPER NUMBER
2815	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/648,111	HWANG, KWANG-JO	
	Examiner	Art Unit	
	ALLAN R. WILSON	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 February 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,11,13-16,20-24 and 28-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,11,13-16,20-24 and 28-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/5/09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 7 and 33 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. For claim 7, plasma gas etching is a dry-etching technique.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5 – 7, 11, 13, 15, 16, 20, 21, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano et al. (USPAT 5771110, Hirano) in view of Chen (USPAT 6133145).

Hirano discloses in figures 1 – 16 a method of manufacturing a liquid crystal display device.

With regard to claim 1, Hirano discloses in figures 1 - 8 forming a switching element (2 - 7) on a substrate (1). Hirano discloses in figure 13 forming a passivation layer (14) over the substrate. Hirano discloses in figure 14 depositing a metal layer (16) on the passivation layer.

Hirano discloses in column 12, lines 54 - 60 forming a photoresist pattern on a surface of the metal layer, such that an upper portion of the metal layer is exposed. Hirano discloses in figure 15 and column 12, lines 54 - 60 etching a portion of the metal layer to form a pixel electrode. Hirano discloses in column 12, lines 54 – 60 the step of etching the metal layer includes etching the metal layer with a composition of HBr plasma gas and Cl_2 plasma gas.

Hirano does not teach treating the exposed portion of the metal layer with a first plasma, prior to etching. Chen teaches in figures 5 and 6 and column 4, lines 16 - 24 treating an exposed portion of a metal layer (10a) with a first plasma (a plasma treatment in a nitrogen ambient, col. 4, lines 20 - 24), prior to any step of etching a photoresist pattern (12b), and prior to any step of etching the metal layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the treating method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal during the entire etch cycle allowing metal electrodes to be defined. Further, "thereby lowering an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the invention of Hirano, would thereby lower an internal binding force in the exposed portion of the metal layer of Hirano. Lowering an internal binding force in the exposed portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano. The combination of Hirano and Chen teaches wherein the

depositing a metal layer on the passivation layer, forming a photoresist pattern, and treating the exposed portion of the metal layer are sequentially performed.

With regard to claim 2, Hirano discloses in column 11, line 63 wherein the switching element is a thin film transistor.

With regard to claim 5, Chen teaches in figure 5 and column 4, lines 16 – 24 using a non-reactive gas to lower a binding force in the exposed portion.

With regard to claim 6, Chen discloses in figure 5 and column 4, lines 16 – 24 wherein the non-reactive gas includes N_2.

With regard to claim 7, Hirano discloses in column 12, lines 54 – 60 the step of etching the metal layer involves a dry-etching technique.

With regard to claim 11, Hirano discloses in column 12, lines 48 – 60 the metal layer is indium tin oxide (ITO).

With regard to claim 13, Chen discloses in figure 5 and column 4, lines 16 – 24 wherein the first gas is a reactive gas.

With regard to claim 15, Chen teaches in figure 5 and column 4, lines 16 – 24 wherein the first gas is a non-reactive gas.

With regard to claim 16, Chen discloses in figure 5 and column 4, lines 16 – 24 wherein the non-reactive gas includes N_2.

With regard to claim 20, Hirano discloses in column 12, lines 48 – 60 wherein the metal layer is indium tin oxide (ITO).

With regard to claim 21, Hirano discloses in figure 15 removing the photoresist pattern from the pixel electrode.

With regard to claim 30, Hirano discloses in figure 14 depositing a metal layer (16) on a passivation layer (14) which partially covers a transistor (2 – 7). Hirano discloses in column 12, lines 48 – 60 forming a photoresist pattern on a surface of the metal layer, leaving an upper portion of the metal layer uncovered. Hirano discloses in column 12, lines 57 – 60 etching the uncovered portion of the metal layer with a second plasma to form a pixel electrode. Hirano discloses in column 12, lines 54 – 60 the step of etching the metal layer includes etching the metal layer with a composition of HBr plasma gas and Cl_2 plasma gas.

Hirano does not teach exposing the uncovered portion of the metal layer to a first plasma, prior to etching. Chen teaches in figure 5 and column 4, lines 16 – 24 exposing an uncovered portion of a metal layer (10a) to at least one first gas (a plasma treatment in a nitrogen ambient, col. 4, lines 20 – 24), prior to any step of etching a photoresist pattern (12b) and prior to any step of etching the metal layer to lower an internal binding force in the uncovered portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the exposing method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal during the entire etch cycle allowing metal electrodes to be defined. Further, "to lower an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the invention of Hirano, would be to lower an internal binding force in the exposed portion of the metal layer. Lowering an internal binding force in the uncovered

portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano. The combination of Hirano and Chen teaches wherein the depositing a metal layer on the passivation layer, forming a photoresist pattern, and exposing the uncovered portion of the metal layer are sequentially performed.

With regard to claim 31, Hirano discloses in figure 14 depositing a metal layer (16) on a passivation layer (14) which partially covers a transistor (2 – 7). Hirano discloses in column 12, lines 48 – 60 forming a photoresist pattern on a surface of the metal layer, leaving an upper portion of the metal layer uncovered. Hirano discloses in column 12, lines 57 – 60 etching the uncovered portion of the metal layer with a second plasma to form a pixel electrode. Hirano discloses in column 12, lines 54 – 60 the step of etching the metal layer includes etching the metal layer with a composition of HBr plasma gas and Cl_2 plasma gas.

Hirano does not teach exposing the uncovered portion of the metal layer to a first plasma, prior to etching. Chen teaches in figure 5 and column 4, lines 16 – 24 exposing an exposed portion of a metal layer (10a) to at least one first gas (a plasma treatment in a nitrogen ambient, col. 4, lines 20 – 24), prior to any step of etching, to lower an internal binding force in the uncovered portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the exposing method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal during the entire etch cycle allowing metal electrodes to be defined. Further, "to lower an internal binding force in the exposed portion of

the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the invention of Hirano, would be to lower an internal binding force in the exposed portion of the metal layer. With regard to claim 30, Hirano discloses in figure 14 depositing a metal layer (16) on a passivation layer (14) which partially covers a transistor (2 – 7). Hirano discloses in column 12, lines 48 – 60 forming a photoresist pattern on a surface of the metal layer, leaving a portion of the metal layer uncovered. Hirano discloses in column 12, lines 57 – 60 etching the uncovered portion of the metal layer with a second plasma to form a pixel electrode. Hirano does not teach exposing the uncovered portion of the metal layer to a first plasma, prior to etching. Chen teaches in figure 5 and column 4, lines 16 – 24 exposing an uncovered portion of a metal layer (10a) to at least one first gas (a plasma treatment in a nitrogen ambient, col. 4, lines 20 – 24), prior to any step of etching a photoresist pattern (12b) and prior to any step of etching the metal layer to lower an internal binding force in the uncovered portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the exposing method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal during the entire etch cycle allowing metal electrodes to be defined. Further, "to lower an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the invention of Hirano,

would be to lower an internal binding force in the exposed portion of the metal layer. Lowering an internal binding force in the uncovered portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano. The combination of Hirano and Chen teaches wherein the depositing a metal layer on the passivation layer, forming a photoresist pattern, and exposing the uncovered portion of the metal layer are sequentially performed.

Claim 22 is rejected under 35 USC § 103 (a) as being unpatentable over Hirano and Chen, and further in view of US Patent No. 6,583,095 to Williams et al. (hereinafter "Williams").

With regard to claim 22, Hirano discloses in figure 14, depositing a metal layer (16) over a substrate (1). Hirano discloses in column 12, lines 54 – 60 forming a mask on a surface of the metal layer, leaving an upper portion of the metal layer uncovered. Hirano discloses in column 12, lines 57 – 60 etching the uncovered portion of the metal layer with a second plasma to form a metal pattern.

Hirano does not teach exposing the uncovered portion of the metal layer to a first plasma. Chen teaches in figure 5 and column 4, lines 13 – 24 exposing an uncovered portion of a metal layer (10a) to a first plasma (a plasma treatment in a nitrogen ambient, col. 4, lines 20 – 24) prior to any step of etching the metal layer, thereby lowering an internal binding force in the uncovered portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the exposing method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient

as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal during the entire etch cycle allowing metal electrodes to be defined. Further, "thereby lowering an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the invention of Hirano, would thereby lower an internal binding force in the exposed portion of the metal layer. Lowering an internal binding force in the uncovered portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano. The combination of Hirano and Chen teaches wherein the depositing a metal layer over a substrate, forming a mask on a surface of the metal layer, and exposing the uncovered portion of the metal layer are sequentially performed.

Further, Hirano and Chen not show the second plasma includes a composition of HBr plasma gas and CH_4 plasma gas having a mixing ratio of approximately 200:50 or a composition of HBr plasma gas and CL_2, plasma gas having a mixing ratio of approximately 200:50. Williams discloses in col. 9, lines 53-56 a composition of HBr plasma gas and CH_4 plasma gas having a mixing ratio of preferably approximately 2:1 to about 6:1 (200:50 is 4:1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have Hirano and Chen us a HBr to CL2 plasma gas ratio of 4:1 to etch a metal layer (col. 1, lines 42-47). The motivation for doing this is to provide anisotropic etching with reduced tapering of etched features (Williams col. 3, lines 1-3).

Note: The prior art of record does not specifically disclose the claimed mixing ratio of approximately 200:50. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the invention of Williams by using the claimed mixing amounts, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable value involves only routine skill in the art. *In re Aller*, 105 USPQ 233. For example, the size of the etch chamber would effect the mixing amounts.

Claims* 32 - 35 *are rejected under 35 USC § 103 (a) as being unpatentable over Hirano and Chen as applied to claims 1, 30 and 31 above, and further in view of Williams.

***Regarding claim* 32 - 35,** Hirano and Chen are discussed above, they do not show the second plasma includes a composition of HBr plasma gas and CH_4 plasma gas having a mixing ratio of approximately 200:50 or a composition of HBr plasma gas and CL_2, plasma gas having a mixing ratio of approximately 200:50. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have Hirano and Chen us a HBr to CL2 plasma gas ratio of 4:1 to etch a metal layer (col. 1, lines 42-47) for the same reason and motivation as applied to claim 22 above.

Claims 3, 4, 14, 23, 24, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano and Chen as applied to claims 1, 13, 22 and 30, respectively, above, and further in view of Muraguchi et al. (JPPAT 361002368, Muraguchi).

With regard to claim 3, Hirano and Chen do not teach the step of treating the exposed portion of the metal layers includes using a reactive gas. Muraguchi teaches in the Constitution using a reactive gas in a step of treating an exposed portion of a metal layer to lower a binding force in the exposed portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the reactive gas of Muraguchi in the method of Hirano and Chen in order to reduce oxygen atoms without resulting in crystal damage to the surface.

With regard to claims 4 and 14, Muraguchi discloses that the reactive gas is H_2.

With regard to claim 23, Hirano, Chen and Williams as applied to claim 22 and for the same reasons as stated above with regard to claims 3, 4 and 14 it would have been obvious to use the H_2 plasma gas of Muraguchi in the first plasma.

With regard to claim 24, Chen teaches in figure 5 and column 4, lines 13 – 24 wherein the first plasma includes N_2.

With regard to claim 28, Hirano discloses in column 12, lines 48 – 60 the metal layer is indium tin oxide (ITO).

With regard to claim 29, Hirano discloses in figure 15 that the metal pattern includes a pixel electrode of a display device.

Response to Arguments

Applicant's arguments filed 1/12/2009 have been fully considered but they are not persuasive.

The amendment to the claims filed on 1/12/2009 adds previous dependent claims 9 and 10 to claims 1, 30 and 31. A rejection of claims 9 and 10 has already been made in the Final

Rejection filed on 9/20/2005 and upheld by the Board of Patents Appeals and Interferences (BPAI) on 6/2/2008. Claims 1, 30, 31 and their dependent claims are rejected above with the same reasoning.

Additionally, in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the treating method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal during the entire etch cycle allowing metal electrodes to be defined.

Applicant's arguments with respect to claims 22-29 and 32-35 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from an examiner should be directed to Primary Examiner Allan Wilson whose telephone number is 571-272-1738. Examiner Wilson can normally be reached 7:00-3:30 Monday-Friday (off first Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Allan R. Wilson/
Primary Examiner, Art Unit 2815